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The Environmental Outlook in Russia

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The Environmental Outlook in Russia

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Key Judgments

Russia during the next decade will be unable to deal effectively with the formidable environmental challenges posed by decades of Soviet and post-Soviet environmental mismanagement and recurring economic crises. Although the prolonged contraction in economic activity has resulted in significant drops in most pollution categories, substantial environmental improvement will depend on an array of socioeconomic, institutional, and cultural changes—facilitated by international engagement—that will only begin to develop sporadically and close to the end of our 10-year time frame at the earliest. Major progress is decades away.

Among Russia's most important environmental problems:

- *Water pollution is the most serious concern.* Less than half of Russia's population has access to safe drinking water. While water pollution from industrial sources has diminished because of the decline in manufacturing, municipal wastes increasingly threaten key water supply sources, and nuclear contamination could leach into key water sources as well. The head of Russia's environmental protection committee estimates that the cost of raising the quality of Russia's entire drinking water supply to official standards could be as high as \$200 billion.
- *Air quality is almost as poor as water quality, with over 200 cities often exceeding Russian pollution limits, and is likely to worsen.* The number of vehicles on the road has increased rapidly, and their emissions will offset reductions in industrial air pollution owing to reduced economic activity and greater reliance on natural gas.
- *Solid waste generation has increased substantially due to adoption of Western-style consumption patterns.* Russian municipalities, however, lack management expertise and landfill capacity to cope with disposal problems.
- *Hazardous waste disposal problems are extensive and growing.* Russian officials estimate that about 200 metric tons of the most highly toxic and hazardous wastes are dumped illegally each year in locations that lack effective environmental or public health protections or oversight.

- *Nuclear waste and chemical munitions contamination* is so extensive and costly to reverse that remediation efforts are likely to continue to be limited largely to merely fencing off affected areas.

Environmental problems are harming both the health of Russia's citizens and the economy:

- US, Russian, and World Bank studies link an increase in respiratory and gastrointestinal illnesses and developmental problems among children in several Russian cities in part to environmental factors. A 1996 joint US-Russian Government study found that one-quarter of kindergarten pupils in one city had lead concentrations above the threshold at which intelligence is impaired, while a US Government study noted a rise in the incidence of waterborne diseases and environmentally related birth defects. A Russian Government report cited air pollution as a contributing factor to 17 percent of childhood and 10 percent of adult illnesses.
- Pollution is adding to budgetary strains, reducing labor productivity through illness and absenteeism, and damaging natural resources. It also is deterring some domestic and foreign investors concerned about cleanup and liability issues. A team of Russian experts has pegged overall economic losses from environmental degradation at 10 to 12 percent of GDP—roughly similar to estimated losses in East European countries and substantially higher than estimates of 1 to 2 percent in developed countries.

Russia's environmental problems also pose substantial threats to other regions and are likely to continue to do so during the next decade:

- Russia is a polluter of adjacent seas, dumping industrial and municipal wastes, chemical munitions, and, until the mid-1990s, solid and liquid radioactive wastes.
- It is likely to continue to be a major producer and exporter of illicit ozone-depleting substances because of widespread black-market activity and also will remain a major emitter of carbon dioxide.

Although Russian Government officials decry the economic and social costs of environmental degradation, they lack the commitment, resources, and organizational capacity to address environmental problems:

- Policymakers are focusing on stopping Russia's economic deterioration and stabilizing the country's financial markets, not on the environmental impact of their actions. Spending on the environment was less than 0.5 percent of total federal budget spending, or about \$480 million in 1997—a significant drop from the modest levels of the late Soviet period. Spending on drinking water quality, for example, was down 90 percent from levels of the 1980s.
- Russia has a comprehensive legal and regulatory framework in the environmental area, but government institutions responsible for environmental protection lack the authority and capability to enforce legislation.
- A continued Russian tendency to treat certain nuclear waste and chemical weapons information as a state secret will complicate Western cleanup assistance programs. The Russian Government recently made broad new categories of environment-related information subject to secret classification in response to revelations about environmental problems at Russian military bases by former military officers.
- Environmental activism has been on the wane since the breakup of the Soviet Union. Despite growing concerns about environmentally related health problems, the Russian public is preoccupied with economic survival and accords much less priority to environmental issues.

Russia is widely expected to be the major financial beneficiary of the carbon-trading scheme associated with the Kyoto Protocol to the UN Framework Convention on Climate Change, mainly because the sharp decline in Russian economic activity has reduced emissions nearly 30 percent below the target level Russia set for the period 2008-12. Under the Protocol, countries exceeding their targeted cuts will be able to sell emission-reduction credits to those unable to meet their targets:

- Even if a future sustained economic recovery increases emissions, Russian officials are convinced that the extensive boreal forest covering

most of the country will act as a major carbon absorber that will earn them substantial revenues well beyond the 2008-12 period if effectively managed.

- According to a MEDEA study sponsored by the National Intelligence Council, however, current carbon flow models contain significant uncertainties, and it is not clear whether Russia's boreal forest is a net absorber or emitter of atmospheric carbon.¹

Even minor improvements in Russia's environment during the next few years will require continued international pressure, aid, management expertise, and foreign investment to compensate for Russian shortcomings, but any government shift toward greater state control of the economy to deal with the ongoing economic crisis would jeopardize at least some of this assistance:

- A number of international institutions and environmental nongovernmental organizations (NGOs) are providing Russia with substantial aid and technical training, as well as assistance on policy priorities, reform, and institution-building.
- Although Russia's latest economic crisis has slowed foreign investment considerably, multinational corporations that have invested in Russia generally have introduced new and more efficient equipment and employ more environmentally friendly practices than Russian firms.

The outlook for more sustained environmental progress over the long term will depend less on foreign assistance and more on whether Russian leaders can muster the courage and skill to implement reforms leading to sound economic growth, greater governmental accountability, and increased public political involvement:

- If Moscow can rein in its ongoing financial crisis and implement sound fiscal, monetary, and corporate governance policies, investors will eventually return to Russia and help set the stage for sustained economic growth that, in turn, would increase government and private-sector capacity and willingness to address environmental concerns.

¹ MEDEA is a group of about 40 US environmental and global change scientists. It is an outgrowth of a CIA-sponsored Environmental Task Force formed in 1992 to use classified systems to examine key environmental questions.

- A higher living standard, along with changes in Russian political culture that increase government responsiveness and reduce public apathy, would gradually strengthen public support for a more robust environmental agenda as it has in more developed countries. It would also boost the influence of environmental NGOs on government and private-sector environmental policies.

Although at least some of these positive indicators may begin to appear near the end of our 10-year time frame, it will probably take decades for Russians to garner the will and the wherewithal to deal with their environmental problems, especially if neo-Communist or nationalist forces come to power and pursue decidedly xenophobic and antireformist policies.

Figure 1
Key Environmental Problem Areas in Russia



Discussion

Scope of Environmental Challenges

Russian Government officials candidly acknowledge that the country has many environmental problems, often using words such as "catastrophe" and "crisis" to describe the scale of the challenge.

Some of the problems are primarily a legacy of Russia's Soviet past. Among the factors most responsible for environmental destruction:

- Soviet planners strongly emphasized the development of heavy industries over other sectors of the economy, and Russia is now burdened with a large stock of aged, inefficient, and highly polluting plant and equipment, the bulk of which requires repair or replacement.
- Soviet production criteria led to inefficient use of Russia's abundant natural resources and energy, which were treated as free or heavily subsidized goods. This encouraged waste.
- The priority of defense and the security surrounding defense industries and military installations allowed authorities to be extraordinarily reckless in their treatment of the environment—including simply dumping radioactive and other hazardous wastes onto nearby land and in waterways.
- The collectivization of agriculture destroyed individual responsibility for the land. Feverish campaigns to "solve the food problem"

led to the overuse of chemical fertilizers and pesticides, the depletion of arable land, and the cultivation of vast areas of marginal and semiarid lands easily damaged by intensive agriculture.

- Environmental standards, although often set high, were seldom enforced. Departments charged with protecting natural resources were often subordinate to ministries whose main goal was increasing production.

Other Russian environmental problems are more closely associated with the country's political and economic transition during the 1990s, particularly its halting move from a command to a free market economy:

- Industrial output has plummeted during the 1990s, but pollution from air and wastewater emissions has not declined as fast. Firms routinely underreport their emissions and cut capital investment, maintenance, and the quality of fuel they use to trim costs (see figures 2, 3, and 4). Such cuts have caused the environmental performance of facilities to deteriorate, and the frequency of industrial accidents that cause environmental damage to increase. Oilspills and leaking oil pipelines, for example, are commonplace.
- The competitive sectors of the new Russian economy tend to be oriented toward production of commodities that are energy, resource,

and thus pollution intensive. During the 1990s, oil, gas, timber, and metals have accounted for about 70 percent of Russia's reported export revenue, and they will continue to comprise the bulk of Russian exports.

- Russia also must confront many of the environmental problems associated with the consumerism and unchecked development associated with free market systems, such as burgeoning solid waste streams from packaged goods, traffic congestion, urban sprawl, and a rush by private firms to exploit natural resources.

Water

Russia's leading environmental concern is water pollution. Municipalities are the main source of pollution, followed by industry and agriculture. Russian and foreign experts estimate that less than one-half of Russia's population has access to safe drinking water. Sixty-nine percent of the nation's wastewater treatment systems lack sufficient capacity. Only 13 percent of reported wastewater flows were treated to meet Russia's relatively high-quality water standards in 1996, the latest period for which we have reporting. According to the Russian Government, "practically all" of the water courses in the Volga watershed—an area that covers two-thirds of European Russia—do not meet Russian standards.

Russia's three military plutonium production sites—Chelyabinsk-65 (often referred to as Mayak) in the southern Urals region, and Tomsk-7 and Krasnoyarsk-26 in southwestern Siberia—have caused extensive contamination of Russian waterways:

- Highly radioactive waste from Chelyabinsk was dumped into a nearby river system from 1948 to 1951 and has migrated over 1,500 kilometers to the Arctic Ocean. Other waste

is stored in open ponds at Chelyabinsk and is seeping into a nearby river.

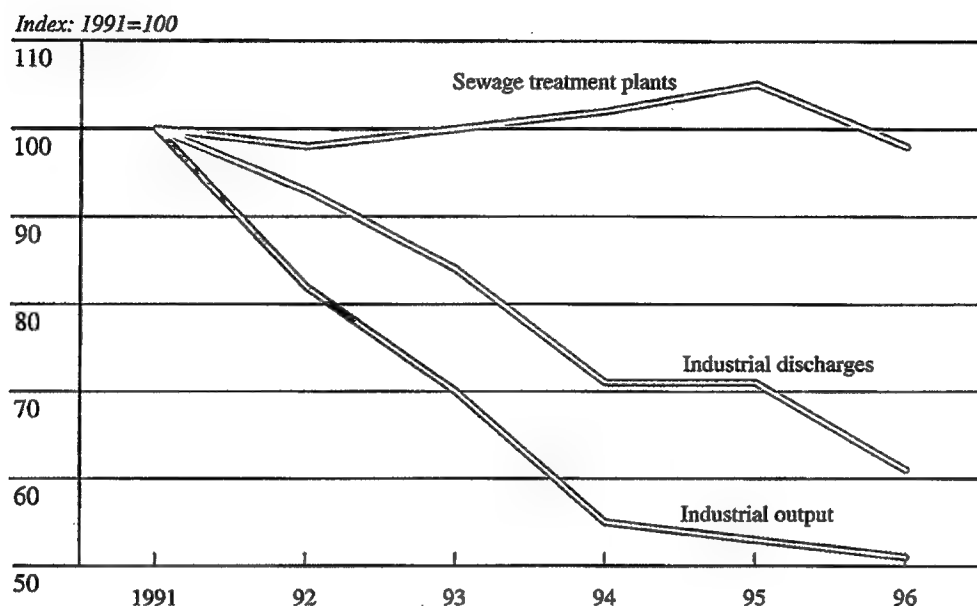
- At Tomsk and Krasnoyarsk, liquid radioactive waste injected into the sandy layers beneath the sites is migrating slowly. If Russia does not maintain its long-term monitoring program, the waste could seep into local and regional water supplies without adequate time to protect against impacts to human health and prevent degradation of the environment.

Water pollution from municipal sources is likely to increase during the next decade as independent households and the services sector place additional burdens on municipal sewage systems. When industrial production recovers, wastewater discharges also will reverse their downward trend. Meanwhile, funding shortages will constrain operations, maintenance, and new investment in drinking water, sewerage, and wastewater treatment systems. They also will limit any efforts to deal with nuclear contamination of waterways and drinking water supplies.

Air

Poor air quality is almost as serious a problem as water pollution. In 1996 over 200 cities in Russia often exceeded the levels prescribed by Russian health standards for annual concentrations of at least one pollutant, according to a Russian Government report. Eight cities exceeded health standards for three or more pollutants, and they did so by at least a factor of 10. In comparison, according to the US Environmental Protection Agency, air pollution levels in the Los Angeles area, which has the

Figure 2
Sources of Russian Water Pollution by Volume of Effluent



Latest available information.

Source: Russian Committee for Environmental Protection.

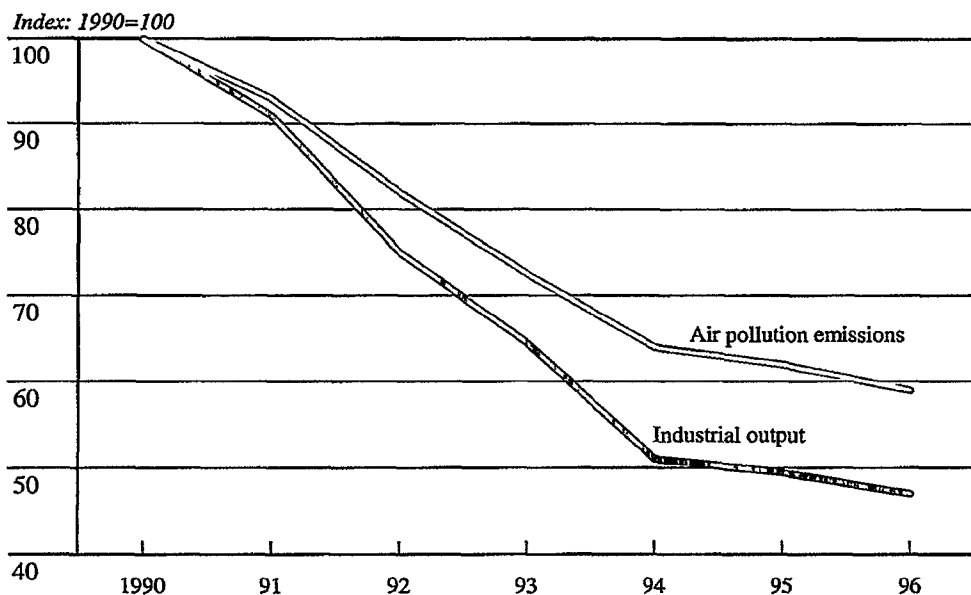
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worst overall air quality in the United States, rarely exceed US standards—which are similar to Russia's—by a factor of more than 1.5.

Although industries continue to pollute the air, emissions from cars and trucks—lead, carbon monoxide, and nitrogen oxides—cause the majority of air pollution. In Moscow, for example, 87 percent of air pollution is attributable to vehicle emissions.

Air quality is likely to worsen as the number of vehicles—many of which are aging and lack adequate pollution controls—increases. From 1991 to 1997, car registrations increased nationwide by 176 percent. The number of cars in Moscow during the same period jumped 250 percent to 2 million. Fuel quality will add to the problem—only half the gasoline produced in Russia is unleaded and, in heavily congested

Figure 3
Reported Russian Industrial Output and
Air Pollution Emissions



Latest available information.

Source: Russian Committee for Environmental Protection.

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areas, lead concentrations often reach at least four times the US air quality standard.

Land

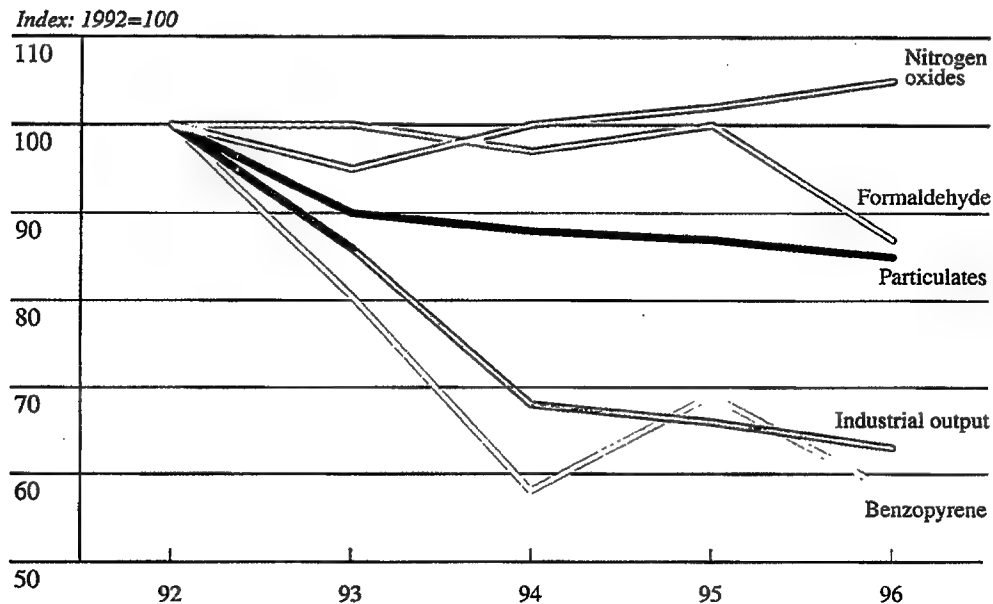
Solid and hazardous wastes present acute threats to the land and are likely to continue to do so:

- Russia's urban and new suburban communities do not have the management expertise or

landfill capacity to cope with solid waste disposal, and the popularity of Western-style consumer goods and packaging has worsened waste disposal problems.

- Russians illegally dump about 200 metric tons of the most highly toxic and hazardous wastes each year in locations that lack any health protections or oversight, according to

Figure 4
Level of Pollutants in the Air in Russia



Latest available information.

Source: Russian Committee for Environmental Protection.

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Russia's environment agency. Hazardous waste disposal problems are likely to increase with the continued illegal dumping of domestic and foreign-origin wastes.

- Russia's military facilities remain significant sources of hazardous wastes. Petroleum-based products have contaminated the ground at many military bases, particularly around

areas used for fuel storage and vehicle maintenance. Radioactive material from Russia's nuclear weapons complexes at Chelyabinsk, Tomsk, and Krasnoyarsk-26 have contaminated the nearby region for decades. Other sites of concern are the home ports of the Northern and Pacific Fleets, where thousands of tons of spent nuclear fuel assemblies, solid

Environmental Conditions Poor Throughout the Former Soviet Union

Environmental conditions generally are poor throughout the former Soviet Union (FSU), and all states lack the commitment, institutional capacity, and funds to deal with them, according to a study sponsored by the DCI Environmental Center:

- *Water pollution, especially of rivers and coastal zones, is the most pervasive ecological problem. All 13 seas in or adjacent to the various states are seriously polluted, and the water volume in some landlocked seas is shrinking. Conditions in the Aral Sea are by far the worst, but the situation also is deteriorating in the Caspian, Black, and Azov regions.*
- *Severe air pollution is prevalent in most FSU cities and is especially serious in those that combine high industrial activity and vehicular traffic. Some of the worst air pollution outside of Russia is in Ukraine, especially in its Dnipropetrovsk-Donetsk region.*
- *Soil degradation is widespread, given common agricultural practices emphasizing high fertilizer and insecticide use. The presence of military bases and large military-industrial complexes in the FSU*

periphery such as the Baltic states also has caused extensive environmental degradation of nearby land and waterway systems.

- *The 47 commercial reactors in use, almost all of them located in the European part of the FSU, are of the older pressurized water or graphite-moderated variety that are the most susceptible to accidents that could become catastrophic.*

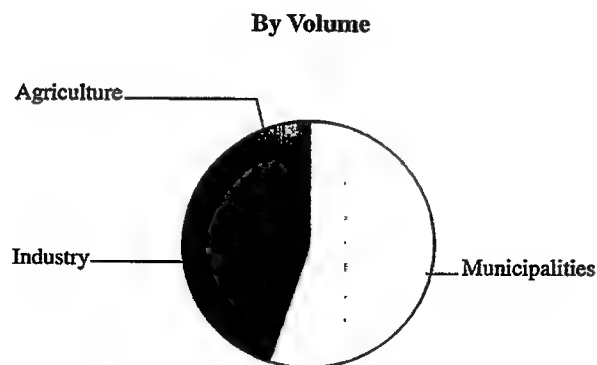
Shortcomings common throughout the FSU hamper efforts to deal with environmental problems. These shortcomings include:

- *A tradition of government secrecy in dealing with negative developments.*
- *Populations that are preoccupied with economic survival at the expense of environmental improvement.*
- *Substantial environmental legislation on the books but inadequate compliance and enforcement.*
- *A dearth of revenues to fund the high cost of environmental cleanup.*

and liquid radioactive wastes, and reactor compartments have accumulated, both as a result of regular naval fleet operations and programs to dismantle and scrap some submarines.

- *Although the Russians established a military ecological service in 1997 to monitor and clean up contamination caused by military activities, funding shortfalls are likely to limit government efforts largely to documenting*

Figure 5
Sources of Water Pollution
in Russia, 1995



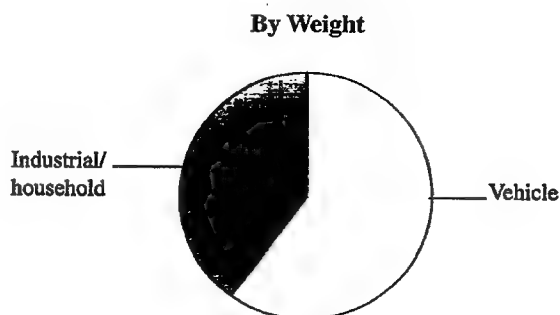
Source: Russian Committee for Environmental Protection.

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stocks and flows, posting warnings, and fencing off hazardous areas.

- Russian forest losses in the 1990s have been double those of the 1980s because of limited efforts to prevent fires, pest infestations, and diseases. Depletion of forests is likely to increase if the government's ambitious plan to boost logging output by subsidizing production and attracting foreign investment is implemented.
- The Soviet regime for many years pushed farming into fragile and arid pasturelands and also supplied farmers with agrochemicals at virtually no cost, resulting in excessive levels of nitrates in up to 10 percent of food samples in Russia. Although subsidies for such

Figure 6
Sources of Air Pollution
in Russia, 1995



Source: Russian Committee for Environmental Protection.

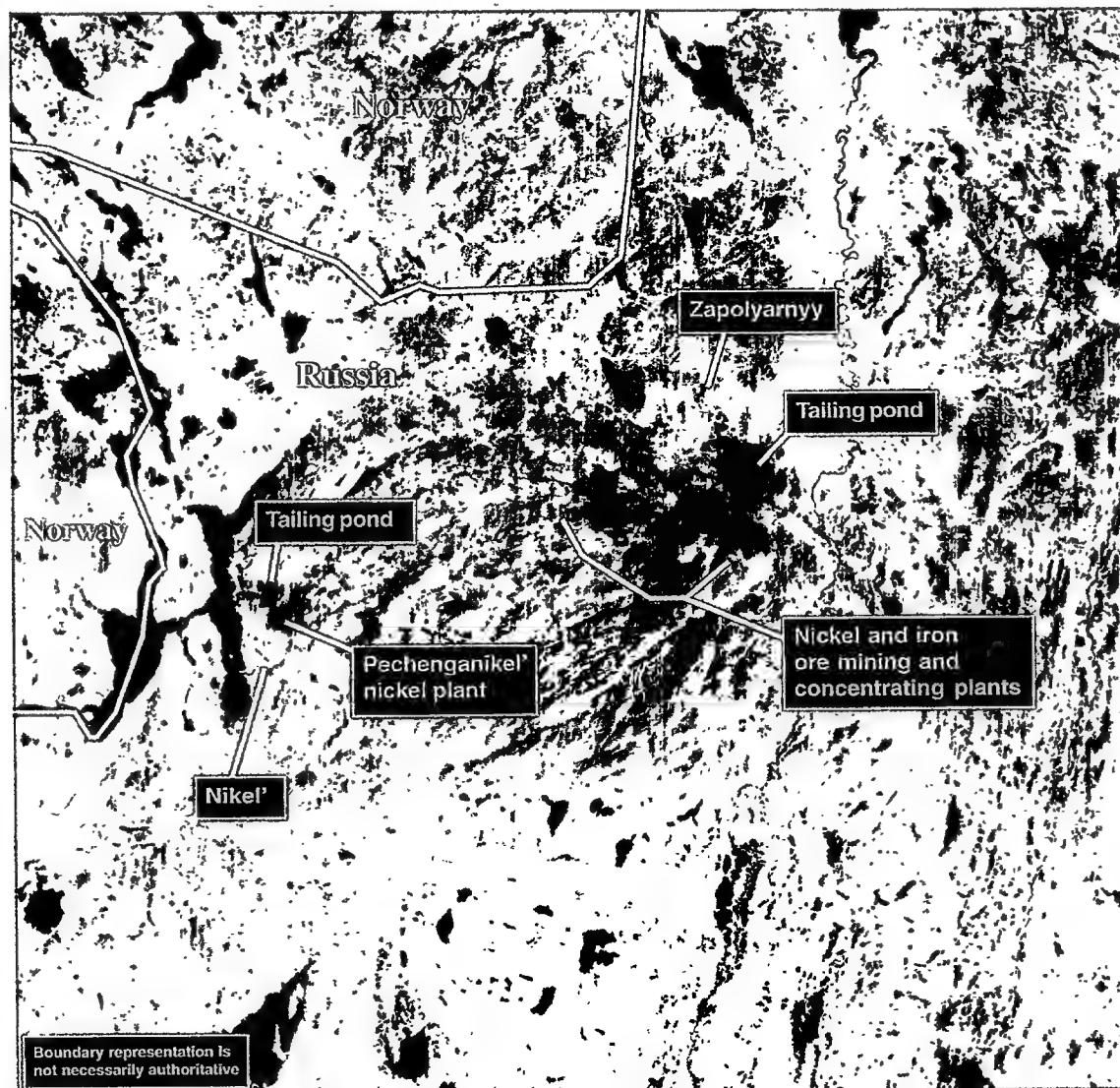
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agrochemicals are being reduced, the widespread soil degradation and groundwater contamination will be difficult and costly to remedy.

Costs of Environmental Degradation

Russia's pervasive water, air, and land pollution is harming both the health of Russia's citizens and the economy. Although total costs are difficult to calculate because of inadequate economic data, the contributing impact of lifestyle factors such as poor diet and smoking, and poor health delivery systems, a variety of official and private studies indicate environmental degradation is taking a heavy toll.

Figure 7
Nikel' Area, Kola Peninsula, Russia
Landsat Imagery, July 1993

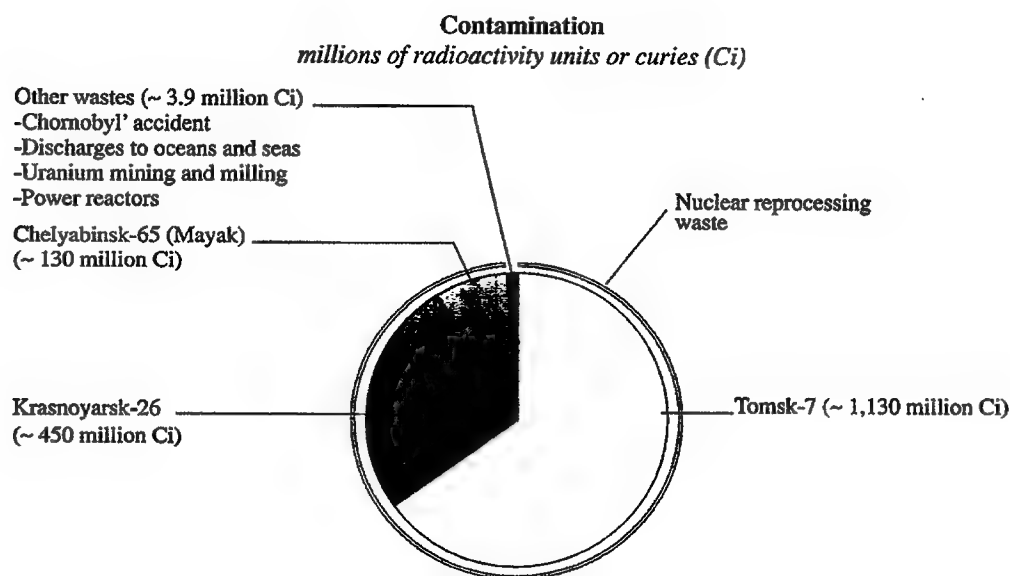


Sulfur dioxide emissions from Russian nickel plants on the Kola Peninsula are responsible in part for severe environmental damage in the surrounding area and threaten the ecology of neighboring countries. Scandinavian countries have been negotiating with Russia to assist in modernizing the nickel plants in order to reduce transborder pollution.

Some experts, however, argue that financial assistance for such antiquated factories is misguided because it would prop up inefficient enterprises that otherwise would fail. Purple and pink areas indicate stressed vegetation or land lacking vegetation (including rock outcrops). Green areas indicate healthier vegetation.

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Figure 8
Distribution of Russian Radioactive Contamination of the Environment



Russia has extensive defense-related nuclear production facilities that have released large amounts of hazardous and radioactive waste materials into the air, surface water, and groundwater in adjacent areas. The radioactive releases to surface waters and the adjacent area at Tomsk-7 and Chelyabinsk-65 are the largest known in the world. These releases are greatly exceeded, however, by the amounts of radioactive waste injected some 350 meters into the ground at Tomsk-7 and Krasnoyarsk-26 since the early 1960s through a deep-well injection process the Russians developed to dispose of radioactive liquid wastes.

Source: Don J. Bradley, *Behind the Nuclear Curtain: Radioactive Waste Management in the Former Soviet Union* (Battelle, 1997).

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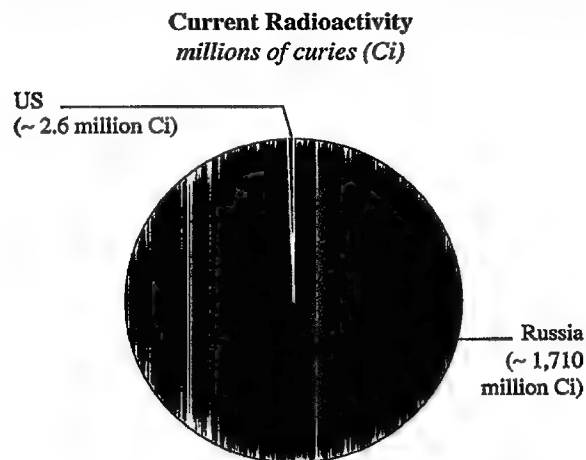
Health Impact

Environmentally related health problems in Russia are extensive and growing, adding to adult and infant mortality rates that have risen substantially over the past decade:

- The link between environmental degradation and poor health is amply reflected in a 1994

World Bank report noting documented cases in several Russian cities of developmental problems among children ingesting lead, of air pollution causing acute and chronic respiratory problems such as bronchitis and asthma, and of nitrates in drinking water causing methemoglobinemia among

Figure 9
Comparison of US and Russian Nuclear Contamination of the Environment^a



^aThis includes direct discharges, tank leaks, and injections into the surface and subsurface.

Source: Don J. Bradley, *Behind the Nuclear Curtain: Radioactive Waste Management in the Former Soviet Union* (Battelle, 1997).

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newborns—which prevents blood cells from absorbing oxygen and leads to slow suffocation.

- A 1996 joint study by the Russian Ministry of Health and the US Centers for Disease Control and Prevention found that one-quarter of kindergarten pupils in the city of Saratov had lead concentrations above the threshold at which intelligence is impaired. A Russian study of children in St. Petersburg found their mercury levels to be 1.5 to 2 times higher than is typical of children in London and New

York, while another study of children in Klin, cited by Laurie Garrett in a 1997 article for *Newsday*, found high rates of asthma, chronic digestive diseases, and endocrine system problems.

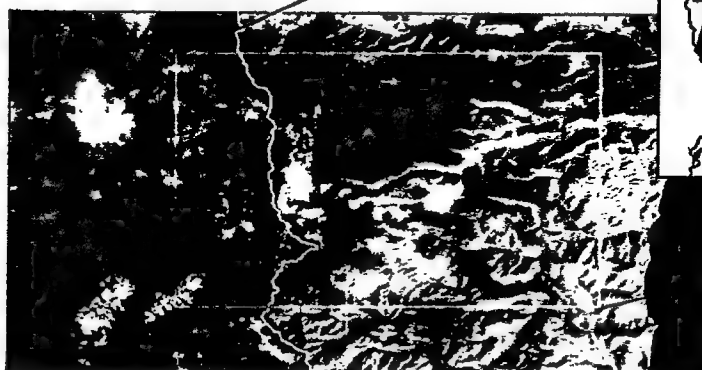
- Although we are not aware of the methodology employed, the Russian Ministry of Health estimates that children exposed to higher levels of air pollution generally suffer 70 percent more illnesses than those living in unpolluted areas, and the Russian State Report on the Environment for 1994 cites air pollution as a contributing factor to 17 percent of childhood and 10 percent of adult illnesses.

Environment-related health problems also appear to be growing. The Defense Intelligence Agency's Armed Forces Medical Intelligence Center (AFMIC) reports that cases of water-borne diseases—such as dysentery, typhoid, cholera, and viral hepatitis A and E—have risen substantially during the past decade. The annual incidence of some, such as dysentery, has increased as much as 25 percent in some years, and there have been a series of dysentery and cholera epidemics in cities such as St. Petersburg in recent years. AFMIC also cites a report by Russian scientists that the number of cases of environmentally related birth defects also is on the increase.

The Russian public has taken note of the adverse impact of environmental degradation on its health. In one public opinion survey, cited in a 1994 study by B. I. Kochurov sponsored by the National Council for Soviet and East European Research, 80 percent of

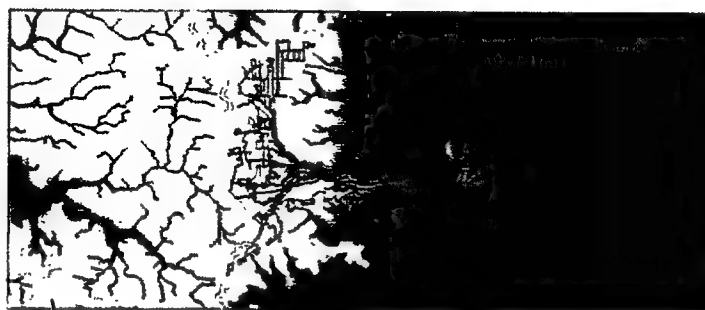
Figure 10
Forest Cutting Activities in the
Far East

Color 1996 Landsat image of Bikin Watershed, Primorskiy Kray, Russia, with NIMA color figure of forest cutting activities since the 1980s.



Landsat image data provide regional monitoring and environmental context.

Digital elevation data provide landform, drainage, elevation, and slope.



0 meters 1,500

The Bikin Watershed, at the north end of Primorskiy Kray, contains some of the last extensive stands of old-growth Korean pine in the world. Korean pine has about three times the commercial value of most other species. The watershed also is a habitat for the Siberian tiger and other endangered species.

A South Korean—Russian logging operation began cutting activities near the Bikin Watershed in 1980. Integration of civil and classified data resources provides comprehensive assessments of forest cutting activities on a regional and local scale.

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respondents associated a decline in their health with pollution, and 68 percent believed pollution affected their children's health.

Economic Impact

Environmental pollution has had a substantially negative impact on Russia's economy. It contributes to health-related budgetary strains, reduces labor productivity, curbs tourism and investment, and lowers the yield of natural resources. Environmentally linked illnesses also limit the military manpower pool:

- Premature mortality related directly to environmental factors resulted in an estimated loss of labor potential of some 82,000 person years in 1991, according to a report to Russia's Security Council. The loss of labor potential because of environment-related illness is far higher. A Russian newspaper reported in October 1997 that one in three draftees is rejected for health reasons—up from one in 20 in 1985 and, in some cases, probably environmentally induced.
- Pollution in the Black Sea has cut the fish catch from 1.5 million tons in 1985 to 100,000 tons in 1994, according to a 1995 Twentieth Century Fund Report by Murray Feshbach, and also has hurt tourism.
- Some foreign firms limit or avoid investing in former Communist states such as Russia, in part because they are concerned they will be responsible for cleaning up past contamination and because of ambiguities about environmental standards, liability rules, and levels of enforcement.

Although we have insufficient information to determine with confidence the economic impact of environmental problems, a team of senior Russian environmental economists and

geographers have pegged total losses from environmental degradation at 10 to 12 percent of GDP. This is similar to estimated losses in East European states, but substantially more than the 1 to 2 percent of GDP lost because of environmental degradation in developed states.

Regional and Global Impact

Russia's environmental problems will continue to pose substantial threats to neighboring regions and to the world during the next decade:

- Russia is a major polluter of the Black and Caspian Seas and other waterways in the region. The cities of St. Petersburg and Kaliningrad are substantial contributors to pollution problems in the Baltic Sea and have been slow to engage in regional cooperative programs to reduce water pollution.
- Nuclear waste storage and disposal will continue to be a formidable challenge. The Russian Navy until the mid-1990s released liquid and solid radioactive wastes into the Arctic Sea, the Sea of Japan, and the Northern Pacific Ocean, causing many countries considerable concern. Although no widespread radioactive contamination of the Arctic marine environment has occurred, runoff from onshore associated naval facilities has contaminated sediment along the shoreline.
- Russia has dumped chemical munitions in the Baltic, White, Barents, and Kara Seas. According to a study by the MEDEA group, however, contamination from any leaking munitions probably would be limited to the area of a dumpsite and to heights of a few meters above the seafloor with little possibility that toxic concentrations could be

transported to nearby shores. Nonetheless, direct contact with leaking munitions, particularly in the Baltic Sea, has harmed and even killed some commercial fishermen.

- Russia continues to produce about half the world's chlorofluorocarbons (CFCs)—linked to depletion of the ozone layer—and ranks third behind the United States and China in carbon dioxide emissions. Russia is likely to remain a significant producer—and exporter—of illicit ozone-depleting substances for at least the next several years, despite an international effort under way to convert Russia's CFC production capacity to environmentally safer products. Most illicit CFCs seized by US Customs in recent years have been produced in Russia. Even if conversion occurs, illicit production, use, and export of CFCs and other ozone-depleting substances is likely to continue, given Russia's thriving black market and weak law enforcement.
- A potentially serious danger emanating from Russia would be radioactive fallout from an accident in one of Russia's 29 poorly constructed, aging, and often poorly maintained nuclear power plants, especially those located close to international borders—such as the plants in St. Petersburg and on the Kola Peninsula. According to one former senior member of Russia's State Atomic and Radioactive Oversight Committee, safety norms for Russian nuclear reactors are greatly outdated.

Limited Impact of Russian Remediation Efforts

Russian Government and business leaders will not be able to make more than limited environmental progress during the next decade, and sustained improvement is probably decades away, especially if the neo-Communists or

The Kyoto Protocol and Russia's Boreal Forest

Under the 1997 Kyoto Protocol to the 1992 UN Framework on Climate Change, Russia pledged that, in the target period of 2008 to 2012, its emissions of six greenhouse gases would not exceed 1990 levels. Because of Russia's economic downturn, carbon emissions today are 25 to 30 percent below this target and are likely to remain below the target through 2012. Russia, therefore, will not be subject to potential mandatory mitigation measures. Russian and most foreign officials and experts, moreover, believe that Russia will be the direct beneficiary of the Protocol's proposed carbon-trading scheme, whereby developed countries that have exceeded their targeted cuts can sell emission reduction credits to those that are having difficulty meeting their targets. The Russian Ministry of Economics claims Moscow could earn as much as \$18 billion by 2005 if a trading scheme is set up soon.

Even if a sustained economic recovery materializes and substantially increases Russian emissions, Russian officials are convinced that Russia's extensive boreal forest cover will act as a major carbon absorber that will earn them substantial revenues well beyond the 2008-12 period if effectively managed. According to a MEDEA study sponsored by the National Intelligence Council, however, current carbon flow models contain significant uncertainties, and it is not clear whether Russia's boreal forest cover is a net absorber or emitter of atmospheric carbon (see annex).

Table 1
Russian Greenhouse Gas
Emission Projections

The lower number represents the probable scenario, the higher number represents a high-growth scenario.

Index: 1990=100^a

	2000	2010
Carbon dioxide	75/78	81/90
Methane	75/80	63/69

Source: Russian Hydrometeorology and Environmental Monitoring Service

^aEmissions for 2000 are significantly lower than 1990 because of the drop in industrial activity following the breakup of the Soviet Union.

nationalists come to power and curb foreign investments and free market reforms. Prolonged economic problems will limit the availability of funding for the environment from both government and private sectors. Continued dependence on pollution-intensive extractive industries and unregulated black-market and organized crime activities also will hamper government and private efforts to clean up the environment. The Russian public will continue to accord priority to immediate socioeconomic needs over environmental improvement.

Government Focusing on Economy

Russian political leaders and bureaucrats lack the commitment, resources, and organizational capabilities to address environmental issues effectively, according to a 1997 study by Demosthenes James Peterson written under the auspices of the National Council for Eurasian and East European Research. Some features of

the government's latest economic plan, such as its support for ailing and highly polluting state enterprises, will further complicate environmental cleanup if they are implemented:

- The Ministry of Natural Resources and the State Committee for Environmental Protection, which are responsible for natural resources management and environmental protection, respectively, lack the incentive and capability to craft and enforce environmental legislation. Businesses or individuals that violate environmental codes typically avoid or minimize penalties, often by paying bribes.
- The Ministries of Economics and Finance—the two institutions that have the greatest de facto influence on environmental conditions in Russia—are focusing on stopping Russia's economic deterioration and stabilizing the country's financial markets, not on the environmental impact of their actions.
- Government spending on the environment is extremely low—even by comparison with limited spending of the Soviet regime during the late 1980s—and is likely to remain so. Less than 0.5 percent of total federal budget spending, or about \$480 million, was allocated in 1997. Spending on water quality dropped 90 percent from levels of the 1980s. The actual amount the Ministry of Finance disbursed, moreover, was about one-third less because of government budgetary adjustments intended to limit the federal deficit.
- Russia's parliament has passed a range of environmental legislation since 1991, but the provisions are poorly drafted and unrealistic

Government Institutions Charged With Environmental Protection

Russia has an extensive bureaucracy devoted to environmental protection and natural resources management:

- ***The Ministry of Natural Resources (Minresursov)*** is the key unit of the government responsible for natural resources management. The Yel'tsin administration formed Minresursov in 1997 to oversee federal water, geology, forestry, wildlife, and fisheries issues. The Ministry, however, has little incentive to advance environmental protection because its officials have ties to the industries they are tasked to regulate and because the ministry benefits materially by promoting resource development through the receipt of various fees and from sales. The Forestry Service, for example, earns half of its \$500 million annual budget from lumber sales.

- ***The State Committee for Environmental Protection (Goskompriroda)*** monitors air and water pollution and biodiversity preservation. The agency, formerly a ministry with wider powers now held by Minresursov, has focused on developing a "polluter-pays" system of off-budget ecological funds. Goskompriroda's accomplishments have been modest because of staff and funding shortages, turf conflicts with the federal natural resource agencies, and several reorganizations. Its "polluter-pays" efforts have shown little result because many firms either are insolvent or evade collection efforts.

- ***The Commission on Ecological Security***, which President Yel'tsin formed in 1994, is one of 10 offices within the National Security Council. The Ecology Commission until last year was headed by Professor Aleksey Yablokov, a respected biologist, environmental activist, and one-time personal adviser to the President. Yablokov used his position on the Security Council to bring to light many sensitive issues, including the Soviet Government's illegal whaling activities, its illegal dumping of nuclear wastes into oceans, and environmental problems related to poor chemical weapons management. In response, Yablokov was relieved of his government duties in 1997, and it is unlikely that environmental issues will soon regain a prominent status within the National Security Council.

Two organizations have primary responsibility for nuclear oversight. The Ministry of Atomic Energy (MINATOM) is responsible for nuclear waste generated at civilian nuclear power plants and at nuclear weapons facilities. The State Service for Atomic and Radiation Safety (Gosatomnadzor) establishes all requirements on the handling and disposal of radioactive material. Both are insufficiently funded to enforce their regulations.

Plethora of Federal Environment-Related Legislation 1991–98

1991	<i>Land Code</i>	1995	<i>Law on Nature Reserves</i>
	<i>Law on Public Health</i>		<i>Law on Protection and Use of Fauna</i>
	<i>Law on Land Use Fees</i>		<i>Law on Subsurface Resources</i>
	<i>Law on Environmental Protection</i>		<i>Ratification of the Convention on Biodiversity</i>
1994	<i>Framework Convention on Climate Change</i>		<i>Ratification of the Basel Convention on Hazardous Waste</i>
1995	<i>Law on Environmental Impact Assessment</i>	1996	<i>Law on the Radiation Safety of the Population</i>
	<i>Law on Continental Shelf of the Russian Federation</i>		<i>Law on Land Improvement</i>
	<i>Forest Code</i>	1998	<i>Law on Solid and Industrial Waste</i>
	<i>Water Code</i>		
	<i>Law on Use of Atomic Energy</i>		

given limited fiscal resources, institutional capacity, and technology.

- Russian environmental assessments often are arbitrary and subject to political manipulation. They also are too imprecise to provide sound guidance for the protection of natural resources.

Private Sector Focusing on Survival and Profits

Economic transition-related pressures—including the reduction of state subsidies, high

interest rates, poor governmental regulation, and pressures to become profitable—are causing most private firms to cut their environmental programs. Such pressures also are fueling completely unregulated black-market economic activities that are harming the environment:

- Many firms have shut down corporate environmental protection departments and stopped or reduced the installation of pollution control equipment. In some cases, firms have shut off pollution controls. At the same

Table 2
Huge Drop in New Pollution Control
Equipment Installed

Index: 1976-80=100

	1976-80	1981-85	1986-90	1991-95
Wastewater treatment	100	63	53	21
Industrial water recirculation	100	144	139	36
Smokestack scrubbers	100	98	110	31

Source: Russian Committee for Environmental Protection

time, managers have become reluctant to report emissions data and grant inspectors access to facilities, claiming they need to protect "commercial secrets."

- Firms also are rushing to exploit natural resources—such as oil, gas, forests, and fisheries—for their current cash value rather than promoting investment in such resources for their future value.
- Black-market economic activities that, according to varying estimates, are responsible for 60 to 90 percent of official GDP, exploit natural resources such as timber, metals, and fish with little or no regulation. For example, economists at the Russian Institute for Economic Research estimate that 20 percent of all trade in timber is unregulated, while the newspaper *Izvestiya* reports that over half the annual 4-million-ton fish catch in Pacific waters is shipped directly to Japan without clearing Russian customs.

Environmental Activism Waning

Although several of Russia's largest nongovernmental organizations (NGOs)—the Socio-Ecological Union, Ecopress, and the Russian Green Party, for example—continue to have a formal advisory role in government councils, the effectiveness of Russia's environmental NGOs has waned since the early 1990s:

- During the late Soviet period, environmental concerns became the focal point for broader political discontent.
- The public's focus has shifted from environmental concerns to economic issues, political liberalization, crime, and ethnic conflict. Only 20 percent of respondents in one poll, for example, named pollution as one of Russia's worst problems, while Russian respondents in a 24-nation poll by the Canadian firm Environomics in 1997 ranked it near the bottom when asked if they would give priority to environmental protection over economic development or give up part of their income to prevent pollution. Few Russians, moreover, are motivated to become activists.
- The recession, an unfavorable tax code, a lack of familiarity with fundraising, and the absence of a tradition of public philanthropy have hampered the NGOs' ability to raise money. At the same time, economic reforms have led to sharp increases in the cost of office space, telecommunications, publishing, and travel.
- Government officials and business interests have increased pressure on environmental activists through the expansion of secrecy

laws, restrictions on their activities, and, some NGOs claim, eavesdropping on their communications.

International Assistance and Investment Offer Some Hope

Given the renewed economic turmoil in Russia, even minor environmental improvements during the next few years will require international pressure, aid, management expertise, and foreign investment. These will compensate to some extent for Russia's lack of the capital, institutional capacity, and political will to devise and implement an effective environmental action program, but any government shift toward greater state involvement in the economy to deal with the ongoing economic crisis would jeopardize at least some prospective foreign aid and investment.

The Positive Impact of Foreign Aid

Although Russia is not a candidate for European Union (EU) membership like many East European countries, and therefore will not be under the same intense pressure to improve its environmental performance in preparation for EU membership, it is receiving considerable international advice and assistance on its environmental efforts. The World Bank, European Bank for Reconstruction and Development (EBRD), EU, and environmental NGOs have provided Russia with substantial aid, technical training, and assistance on policy priorities, reform, institution-building, and environmental legislation:

- The World Bank has designed and implemented regional programs for the Baltic and Black Seas and has provided environmental project loans to Russia amounting to several hundred million dollars for cleaning up major

New Environmental Secrecy Measures

The Yel'tsin administration in October 1997 and January 1998 made broad new categories of environmentally related information subject to secret classification. These include defense-related meteorological, geological, and cartographic work; the surveying and production of precious minerals; and the use of land and water by security services. The Yel'tsin administration also has instituted policies mandating that all information pertaining to military nuclear facilities be classified state secrets in response to damaging revelations about environmental problems by former military officers.

- *In 1996, the Federal Security Service (FSB) arrested Aleksandr Nikitin, a former Navy officer, and charged him with high treason. He spent 10 months in jail for allegedly revealing classified information about environmental problems of Russia's Northern Fleet—information Nikitin asserts was in the public domain. At Nikitin's October 1998 trial, the judge sent the case back to the prosecutor for additional investigation—a victory for Nikitin. He remains, however, under city arrest in St. Petersburg.*
- *Journalist and former Navy officer Grigorii Pasko remains in prison since his 1997 arrest by the FSB for treason for publicizing nuclear waste problems of the Pacific Fleet.*

oil spills and other environmental reclamation and improvement projects.

- The EBRD has provided Russia with financing for several major environmental projects, including one aimed at revamping St. Petersburg's dilapidated water and sewerage network. These and other EBRD-supported projects must meet rigorous environmental impact criteria.
- The EU provides aid, technical assistance, and training for environmental impact assessments, coastal zone management in connection with the Black Sea Regional Environmental Program, and public awareness of environmental issues. The EU also provides training for government officials on the use and adaptation of EU environmental legislation.

The Environmental Working Group of the US-Russian Joint Commission on Economic and Technical Cooperation is a major bilateral channel through which the United States engages Russia on environmental issues (see figure 11).

The Greening Effect of Foreign Investment

Although much of the \$10 billion invested in Russia from 1989 to 1997 has focused on pollution-intensive sectors such as oil, logging, and consumer goods, most multinational corporations employ more efficient equipment and technology and generally use more "environmentally friendly" practices than Russian firms, according to another 1997 study by Peterson produced under the auspices of the National Council for Eurasian and East European Research:

- An international consortium developing oil and gas off Sakhalin Island is using the latest

equipment and practices. Elsewhere, the Polar Lights joint venture between CONOCO and its Russian partners received an environmental achievement award.

- The numerous oil development projects by Western companies currently under way in the Caspian Sea region pose fewer environmental threats than comparable Russian and Soviet projects undertaken over the last 40 years.
- The Russian Industrial Consortium for Protecting the Environment, a group of international packagers, is attempting to improve waste management and recycling schemes to lessen the impact of disposable packaging in Moscow and St. Petersburg.

Moreover, multinational corporations that observe environmental standards are likely to press the Russian Government to enforce environmental regulations to prevent Russian competitor firms from gaining a cost advantage.

But Russian Reforms and Public Support Needed

The outlook for substantial environmental progress over the longer term will depend less on foreign help and more on whether Russian leaders—regardless of political orientation—muster the courage and skill to implement reforms that boost investor confidence and fuel the economic growth needed to fund environmental institution-building and improvements. It also will depend on the growth of government institutional capacity and accountability and on whether the Russian public overcomes its political apathy and becomes more focused on environmental issues. At best, such trends

How Much Would Cleanup Cost?

The costs of substantially reducing Russia's environmental pollution will be prohibitively high, given Moscow's chronic fiscal problems. For example:

- *The cost of cleaning the coast of Russia's maritime territory in the Russian Far East would be about \$5 billion and take 20 years, according to a group of Russian, US, and Norwegian experts.*
- *Bringing the quality of Russia's entire drinking water supply up to official standards would require expenditures of about \$200 billion, according to a statement attributed to Viktor Danilov-Danilyan, Chairman of Russia's State Committee for Environmental Protection, by Murray Feshbach in a 1998 study on environmental and health problems in the former Soviet Union.*

The cost of raising the nuclear safety levels to official standards for the entire former Soviet Union, most of which would have to be borne by Russia, would be about \$26 billion, according to Russian estimates.

may begin to appear toward the end of our 10-year time frame at the earliest, but major progress is probably decades away, especially if neo-Communist or nationalist forces come to power and pursue decidedly xenophobic and antireformist policies that curtail foreign aid and investment and limit economic recovery.

Retaining the support of the international financial community, while also boosting direct and equity investment, will require reducing the uncertainties related to fiscal and tax policy, property ownership, and corporate governance:

- Tax and regulatory simplification and better definition of property and shareholder rights would encourage property holders and corporate decisionmakers to plan with a longer term view. Bringing a significant share of Russia's underground economy into the open would facilitate tax collection and environmental monitoring efforts.

Tax and other incentives would encourage purchase of new plant and equipment, which would lower industry's use of energy and cut pollution:

- According to the Ministry of Fuels and Energy, upgrading equipment in fuel and energy sectors could cut carbon emissions by 25 percent. Russia's Energy Research Institute estimates that better matching of regional generating capacity with electricity demand could conserve up to \$1 billion of fuel per year.

Further government cuts in subsidies for industrial production, fertilizers, and pesticides would prompt heavy industry and mining firms increasingly to use more efficient technologies and to adopt more environmentally friendly practices:

- Uralmash, Russia's biggest privatized heavy machinery plant, already has taken conservation measures that have held its energy bill at 22 percent of its total costs, compared to 41 percent had the company done nothing.

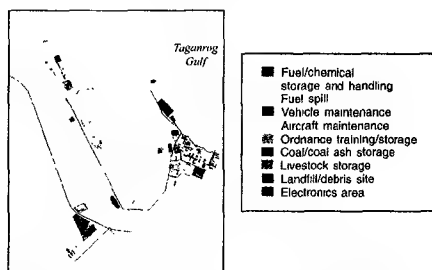


Figure 11

United States–Russia Environmental Working Group

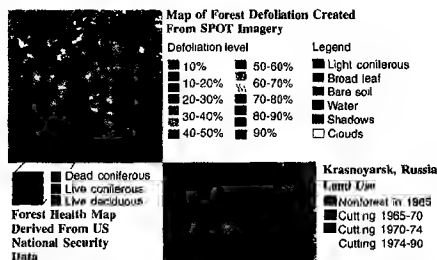


Military Base Cleanup, Yeysk Airfield



Lack of detailed information about decades-old dumping and facilities-use practices at military bases seriously hampers environmental cleanup efforts. US specialists used data derived from US intelligence satellites to develop a history of land use at an airbase in southern Russia, at Yeysk. These data were given to the Russians in December 1995 and marked the first time such "derived information products" were exchanged between our two countries.

Assessing Forest Defoliation



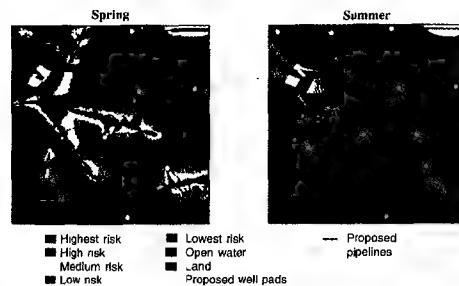
The EWG demonstrated that space-based imagery derived products used with conventional civil imagery provide highly accurate information about important forest characteristics. Covering relatively large areas, these methods are cheaper and easier to evaluate than traditional ground surveys, giving a clearer understanding of stresses from severe weather, fire, and insect infestation that will improve Russian forest management practices.

Vice President Gore and former Prime Minister Chernomyrdin established the US-Russian Environmental Working Group (EWG) in June 1995 during their fifth meeting of the US-Russian Joint Commission on Economic and Technological Cooperation. The EWG was to be the mechanism for bilateral cooperation at the unclassified level between civil scientists and the respective intelligence communities on environmental issues. The EWG was an outgrowth of a similar US program, the Environmental Task Force (ETF), which was created in 1992. The ETF made data and technology from US national security systems available to cleared US environmental scientists.

The mission of the EWG is to explore ways that unclassified data and information from both US and Russian national security systems, including space-based, airborne, maritime, and in situ systems, can be used for environmental purposes.

The EWG is a unique forum. It brings together leading environmental scientists with specialists and experts from the intelligence communities of both countries, who can exchange unclassified information derived from classified data collection systems and from secret or restricted data archives (derived products). The EWG has successfully demonstrated the value of using these derived products in a wide range of environmental applications. Furthermore, the EWG has demonstrated the ability of the two countries' intelligence communities to work together on problems of mutual interest and benefit.

Oil and Gas Risk Assessment



The EWG found that high-resolution imagery aids in understanding the environmental risk from oil and gas development. Here in Western Siberia, such imagery can help locate infrastructure (roads, oil/gas pipelines, power grid, etc.) to minimize potential environmental consequences. The risk is higher in the spring because of water from melting snow.

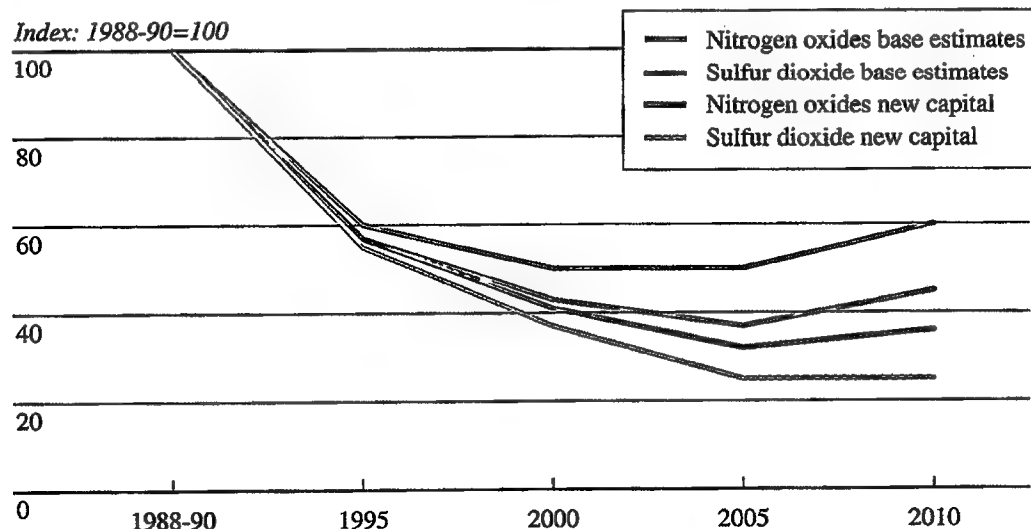
Assessing Earthquake Damage



Used in conjunction with Russian air photos of earthquake damage, high-resolution space-based imagery can be used to produce derived products showing different classes and categories of earthquake damage. Comparisons of before and after images give ground crews better overview of details of urban damage, enhancing response and cleanup efforts.

Figure 12

Value of Modern Technology: Reduction in Projected Russian Emissions With New Equipment Compliant With EU Standards



New capital equipment introduced to replace old equipment can either meet current EU emissions standards or emit more than EU standards allow. The graph illustrates the effect of these choices on total projected emissions. The decline in emissions is primarily due to the decline of industry after the fall of the Soviet Union.

Base estimates: Neither old nor new capital equipment meets current EU emissions standards.

EU new capital: New capital equipment meets current EU emissions standards.

Source: World Bank estimates.

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- The St. Petersburg power utility, Lenenergo, replaced a conventional boiler with a gas turbine, manufactured locally by a joint venture with a European firm, that probably will reduce nitrogen oxide emissions by 50 percent and save up to 20,000 tons of fuel.

Business incentives also could help Russia move away from using high carbon-emitting fuels—probably with little dislocation. Russia

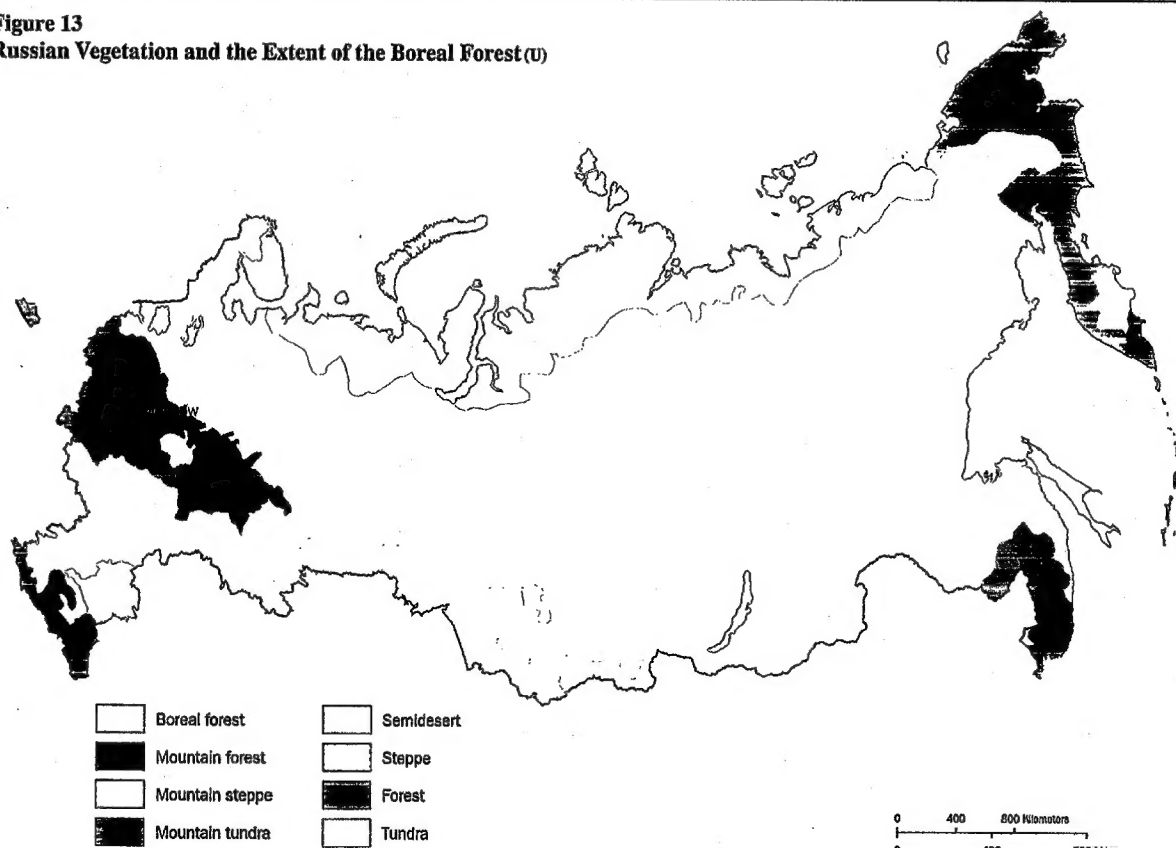
has about one-third of the world's natural gas reserves and most industry experts estimate that gas prices will remain low for the next decade:

- A major source of natural gas from the Yamal area of western Siberia is likely to come on line during the next 10 years, for example, and UES, the national power utility, plans to increase the share of natural gas in thermal

power generation from about one-half to two-thirds in the same period.

Should Russia experience a prolonged economic recovery that satisfies basic needs such as jobs and housing, Russians would be inclined to focus more than in the past on quality-of-life issues such as the environment—particularly its impact on public health. Neither the public nor environmental NGOs would be likely to overcome their current apathy and lobby actively for environmental causes, however, unless Russian leaders become more responsive to public opinion in general and environmentalists conclude that activism can have an impact.

Figure 13
Russian Vegetation and the Extent of the Boreal Forest (U)



Annex

Carbon Exchange and the Role of the Russian Boreal Forest

MEDEA has examined the role of the Russian boreal forest and its relationship to carbon issues in the context of the Environmental Working Group of the US-Russian Joint Commission on Economic and Technical Cooperation and the Kyoto Protocol of the UN Climate Change Convention. MEDEA's efforts included reviewing the state of knowledge of the Russian boreal forest region and assessing the uncertainties in estimating the rates of carbon exchange between terrestrial and atmospheric systems.

The boreal forests of the world are predominantly coniferous woodlands occupying a continuous zone around the world at northern latitudes just south of the Arctic tundra zone. In the boreal forest, aboveground vegetation is dominated by species of spruce, fir, pine, and larch, that can withstand cold and harsh conditions most of the year. Much of the forest area is underlain by permafrost and wetland areas, called peatlands.

Approximately two-thirds of all boreal forests are located in Russia. The Russian Federal Forest Service (FFS) manages 1,110 million hectares ² (Mha) of land area, of which 886 Mha is forest land, with 763 Mha actually covered by trees.

² 1 hectare = 10,000 m² = 2.471 acres. (U)

Russia's boreal forest region is one of the largest single reservoirs of carbon in the world, storing more than one-fifth of carbon found in all terrestrial biomes. This carbon pool is 20 percent larger than that found in temperate and tropical forests combined. The soils and peat contain about 80 to 90 percent of the carbon. (See figure 14.)

Russian scientists and foresters claim that the Russian boreal forest can be managed for the purpose of increasing carbon removal from the atmosphere, arguing that the current carbon removal rate is well below its potential:

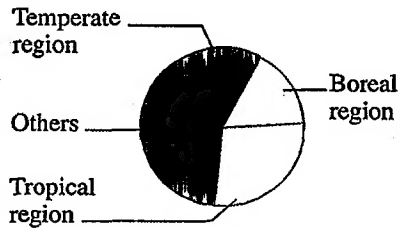
- Russian Government studies conclude that the Russian boreal forest is absorbing atmospheric carbon at a rate of 160 million tons of carbon per year.³
- The studies also predict that the Russian forest will continue to represent an important sink beyond 2040.

MEDEA, however, after reviewing the Russian studies, believes that it is extremely difficult to conclude that the Russian boreal forest functions either as a net source or net sink of atmospheric carbon. In particular, MEDEA believes that the extent of disturbance to the boreal forest region because of fire, insect infestation, and logging is significantly underestimated. MEDEA also is skeptical of the

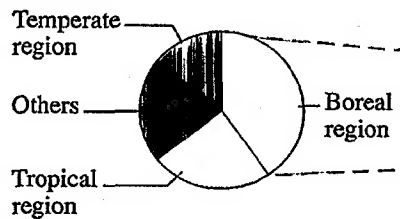
³ The total fossil fuel emissions from the Russian Federation in 1990 was 654 million tons of carbon.

Figure 14
Storage of Carbon in the Russian Boreal Forest

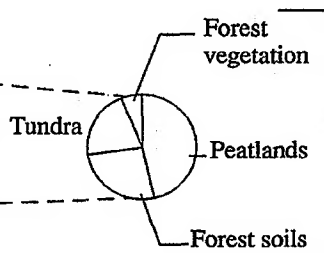
Land Surface Area



Terrestrial Carbon Storage
Total = 2,115 Gt



Boreal Region Carbon Storage
Total = 855 Gt



Global boreal
forest carbon
storage

675 Gt

Russian boreal
forest carbon
storage

$0.67 = 452 \text{ Gt}$

67% of world's
boreal forest
is in Russia

Gt = Billions of tons.

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Sink or Source?

Opinions in the scientific community differ about whether Russia's boreal forest is acting as a net sink (absorber) or source (emitter) of atmospheric carbon:

- *Those arguing that the boreal forest is a net sink note that, historically, boreal forests store carbon because of accumulation of large amounts of dead organic matter in peatlands and forests underlain by permafrost. They also note decreases in logging in the boreal forest region.*
- *Others, arguing that the boreal forest is a net source of atmospheric carbon, maintain that warming in the boreal region during the past 30 years has increased thawing of the permafrost, causing carbon to be released into the atmosphere. Moreover, they note that fires in the region have increased, causing more carbon to be released into the atmosphere than is being sequestered.*

Russian studies' conclusions because of uncertainties in Russian models that estimate the amount of carbon in the soil and the rate that it cycles to the atmosphere.

MEDEA believes that, during the next decade, use of multiresolution imagery from civil and national security systems and field data can reduce scientific uncertainties about the role of the boreal region in atmospheric carbon control. Multistaged sampling offers a means to map and quantify Russian boreal forest land cover change, carbon-related forest parameters, permafrost dynamics, and the frequency and significance of disturbances.